

CHAPTER-7

Joints

Core Resources

Tortora and Grabowski- Principles of Anatomy and Physiology
Chapter 9

Introduction

In this chapter, we shall review the terms relating to the study of arthrology. We shall also cover the different types of joints, their structure and function, and shall review the structure and function of ligaments, tendons, bursae and synovial sheaths.

Learning outcomes

The student should be able to:

- Define a joint
- Arrange the joint types into categories
- Be able to draw a diagram of, and label a typical synovial joint
- Describe the extra-capsular structures
- Identify the types of synovial joints



Joints

Definition: A joint is a point of contact between two bones, between bone and cartilage, or between bone and teeth.

Another word for 'joint' is an articulation or arthrosis, and we say that two bones *articulate* with one another.

Types of Joints

Joints are classified into three categories, based on the presence or not of a synovial joint cavity and the type of connective tissue it possesses.

- 1) Fibrous Joints
- 2) Cartilaginous Joints
- 3) Synovial Joints

Fibrous Joints

These joints are held very close together by fibrous connective tissue, which is rich in collagen fibres. The joint permits very little or no movement and they do not have a synovial cavity.

Examples of this type of joint are:

- The sutures between the skull bones.
- Between teeth and the maxilla and mandible bones.

Cartilaginous Joints

These joints are held together by cartilage, and they too, lack a synovial cavity. These joints allow very little or no movement, but do serve as a 'shock absorber' for weight bearing joints.

There are two types of cartilaginous joints:

- A symphysis - where the joint is connected via a disc of fibrocartilage, for example the intervertebral discs and the symphysis pubis.
- A synchondrosis - is a cartilaginous joint which is connected with hyaline cartilage, such as the epiphyseal plate of long bones.

Synovial Joints

These joints are freely movable joints, and the terms of movement, which you have studied, refer to these types of joints. The motion available may be gliding (nonaxial), uniaxial, biaxial or multiaxial. Synovial joints have a space (synovial cavity) between the articulating bones. There are six main types of synovial joint, which include planar, pivot, hinge, saddle, condyloid and ball and socket joints.

Examples include:

- The knee
- The shoulder joint
- The interphalangeal joints.

The **articulating bones** are covered with an **articular (hyaline) cartilage**, to produce a smooth articular surface. This articular cartilage plays no role in binding the articulating bones together but functions to reduce friction between the bones during movement, and to absorb shock.

In osteoarthritis, the articular cartilage becomes worn away – leaving raw bone articulating against bone.

The **articular (joint) capsule** surrounds the joint, and encloses the **synovial cavity**. It is made up of two components:

- 1) **The outer fibrous capsule** – made up of dense irregular connective tissue. This sleeve permits movement of the joint, but contributes great tensile strength to prevent dislocation of the articulating bones. Some parts of the fibrous capsules are made up of bundles of parallel fibres called ligaments, which hold bones together. (Tendons attach muscles to bones)
- 2) **The inner synovial membrane** – is made up of areolar connective tissue with elastic fibres, and are lined with epithelial cells which secrete synovial fluid. It may contain adipose tissue, which function as ‘shock absorbers’ and are termed articular fat pads.

Synovial fluid fills the synovial cavity. It has a similar appearance and viscosity to egg white, and is a filtrate of blood plasma secreted by the synovial membrane.

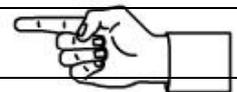
Functions include:

- a) Reduces friction by lubricating the joint.
- b) Supplies nutrients to the chondrocytes, and removes waste metabolites.
- c) Phagocytic cells remove microbes, and the debris of wear and tear.
- d) Maintains joint stability by holding the joint together.

Extracapsular structures

- **Bursae** – these are sac-like structures containing synovial-like fluid, which function to reduce friction in some joints. Bursae (singular= bursa) may be found in the knee – where skin rubs over bone, or the shoulder joints – where there may be friction between tendons, bones, muscles and ligaments.
- **Tendon sheaths** – are tube-like bursae, which wrap around tendons where there is considerable friction, for instance at the wrists and ankles where there is a great crowding of tendons in a confined space.
- Ligaments, muscles and tendons help to stabilise the joint.

Activity 7.1



Note down the 6 types of synovial joints, and be able to give an example of each.

Type	Example
1	
2	
3	
4	
5	
6	

Time required: (10-15 minutes)

Self-assessment questions



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1. Compare and contrast the structure and function of synovial, fibrous and cartilaginous joints
2. Name examples of the following synovial joint architecture:
 - a. Ball and socket
 - b. Hinge
 - c. Pivot
 - d. Condylar
 - e. Plane
 - f. Saddle
3. Using the knee as an illustration write a detail account on the structure of synovial joints.
4. Label the following plates:
Plate-10